

Perform the indicated operation, if possible. If it is not possible, state the reason.

1. $\begin{bmatrix} -6 & 7 \\ 0 & 3 \end{bmatrix} + \begin{bmatrix} -6 & 2 \\ -8 & 1 \end{bmatrix}$

$$\begin{bmatrix} -12 & 9 \\ -8 & 4 \end{bmatrix}$$

2. $5 \begin{bmatrix} -9 & 3 \\ 4 & -1 \end{bmatrix}$

$$\begin{bmatrix} -45 & 15 \\ 20 & -5 \end{bmatrix}$$

3. $\begin{bmatrix} 10 & 17 & -9 \\ -6 & 4 & 11 \end{bmatrix} - \begin{bmatrix} -6 & 8 & -2 \\ -4 & -9 & 4 \end{bmatrix}$

$$\begin{bmatrix} 16 & 9 & -7 \\ -2 & 13 & 7 \end{bmatrix}$$

4. $\begin{matrix} 2 \times 2 & 2 \times 2 \\ \begin{bmatrix} 4 & 1 \\ -3 & 0 \end{bmatrix} & \begin{bmatrix} -7 & 5 \\ 7 & -3 \end{bmatrix} \end{matrix}$

$$\begin{bmatrix} -21 & 17 \\ 21 & -15 \end{bmatrix}$$

5. $\begin{matrix} 2 \times 1 & 2 \times 1 \\ \begin{bmatrix} -16 \\ 2 \end{bmatrix} & \begin{bmatrix} 4 \\ 15 \end{bmatrix} \end{matrix}$

not possible

6. $\begin{matrix} 2 \times 2 & 2 \times 1 \\ \begin{bmatrix} 5 & -1 & 0 \\ 4 & -2 & 9 \end{bmatrix} & \begin{bmatrix} 12 \\ -7 \\ 3 \end{bmatrix} \end{matrix}$

$$\begin{bmatrix} 67 \\ 89 \end{bmatrix}$$

Find the determinant of the matrix.

7. $\begin{bmatrix} 13 & 7 \\ -11 & -4 \end{bmatrix}$

$$-52 + 77 = \boxed{25}$$

8. $\begin{matrix} + & + & + \\ \begin{bmatrix} 6 & 0 & 5 \\ -4 & 2 & 1 \\ 1 & 0 & 0.5 \end{bmatrix} & \begin{bmatrix} 6 & 0 \\ -4 & 2 \\ 1 & 0 \end{bmatrix} \end{matrix}$

$$= 6 \cdot 2 \cdot 5 + 0 + 0 - 5 \cdot 2 \cdot 1 - 0 - 0$$

$$= 6 - 10$$

$$= \boxed{-4}$$

Use Cramer's Rule to solve the linear system.

9. $\begin{cases} 8x + 3y = 1 \\ 7x + 3y = -1 \end{cases}$

$$x = \frac{\begin{vmatrix} 1 & 3 \\ -1 & 3 \end{vmatrix}}{\begin{vmatrix} 8 & 3 \\ 7 & 3 \end{vmatrix}} = \frac{3+3}{24-21} = \frac{6}{3} = 2$$

$$\boxed{\begin{matrix} x = 2 \\ y = -5 \end{matrix}}$$

$$y = \frac{\begin{vmatrix} 8 & 1 \\ 7 & -1 \end{vmatrix}}{\begin{vmatrix} 8 & 3 \\ 7 & 3 \end{vmatrix}} = \frac{-8-7}{24-21} = \frac{-15}{3} = -5$$

Find the inverse of the matrix.

10. $\begin{bmatrix} -2 & -5 \\ 3 & 8 \end{bmatrix}$

$$\frac{1}{\det(A)} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$$\frac{1}{-16+15} \begin{bmatrix} 8 & 5 \\ -3 & -2 \end{bmatrix} = \boxed{\begin{bmatrix} -8 & -5 \\ 3 & 2 \end{bmatrix}}$$

Solve the matrix equation.

11. $\begin{bmatrix} 1 & 1 \\ -5 & 3 \end{bmatrix} X = \begin{bmatrix} 7 \\ -3 \end{bmatrix}$

$$\text{inverse} = \frac{1}{3+5} \begin{bmatrix} 3 & -1 \\ 5 & 1 \end{bmatrix} = \begin{bmatrix} 3/8 & -1/8 \\ 5/8 & 1/8 \end{bmatrix}$$

$$X = \begin{bmatrix} 3/8 & -1/8 \\ 5/8 & 1/8 \end{bmatrix} \begin{bmatrix} 7 \\ -3 \end{bmatrix}$$

$$\boxed{X = \begin{bmatrix} 3 \\ 4 \end{bmatrix}}$$